MISASA V “Comprehensive Exploration of the Solar System: Sample Return and Analysis”

# Laboratory studies of cometary materials -- continuity between asteroid and comet

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Laboratory analysis of cometary samples have been enabled by collection of cometary dust in the stratosphere by high altitude aircraft and by the direct sampling of the comet Wild-2 coma by the NASA Stardust spacecraft. Cometary materials are composed of a complex assemblage of highly primitive, unprocessed interstellar and primordial solar system materials as well as a variety of high temperature phases that must have condensed in the inner regions of the protoplanetary disk. These findings support and contradict conclusions of comet properties based solely on astronomical observations. These sample return missions have instead shown that there is a continuity of properties between comets and asteroids, where both types of materials show evidence for primitive and processed materials. Furthermore, these findings underscore the importance and value of direct sample return. There will be great value in comparing the findings of the Stardust cometary coma sample return mission with those of future asteroid surface sample returns OSIRIS-REx and Hayabusa II as well as future comet nucleus sample returns.